

*Prunus Laurocerasus*, *Hedera Helix*, *Ardisia crispa*, and all needle bearing trees and shrubs. When injured by smoke the homobaric leaves show the injury to the whole leaf due to the gases distributing themselves throughout the whole intercellular system, while the heterobaric leaves show the injury in spots corresponding to individual intercellular chambers.—WM. CROCKER.

**Nitrogen fixation by *Azotobacter*.**—HUTCHINSON,<sup>12</sup> in agreement with KOCH, REMY, and others, finds that the nitrogen content of sand or soil may be increased appreciably by the activity of *Azotobacter* when some suitable source of energy is supplied. Sugars proved very effective as an energy source, and distinct gains were obtained with plant residues. In pot cultures the nitrogen gains ran as high as 9 mg. of nitrogen per gram of plant residue added. Even in field cultures additions of sugar increased crop yields 20-54 per cent when conditions were favorable. HUTCHINSON believes the carbohydrates of plant residues act in a similar way in furthering nitrogen fixation and crop yields. For successful operation of this organism suitable temperature, the presence of phosphates, and a supply of basic material such as calcium carbonate are necessary. Besides these factors, some unknown conditions appear periodically in the soil, interfering with the action of this organism.

The effect of the addition of straw or other crop residues to the soil may be very complex. As important among these effects may be mentioned modification of physical condition of the soil, direct addition of nutrients (in the case of straw, considerable potash, little nitrogen as well as other nutrients), and the indirect addition of nitrogen through furnishing an energy source for *Azotobacter*.—WM. CROCKER.

**Fucosan vacuoles.**—HANSTEEN noted that granules, as he called them, accumulate about the chromatophores of Phaeophyceae during carbon assimilation. He thought they were produced by the chromoplasts and were the first visible product of carbon assimilation. On this basis he called them fucosan granules. KYLIN<sup>13</sup> has made a rather extensive study of these bodies, the results of which are summarized in the article here reviewed. He finds that these bodies are vacuoles rather than granules, and while they are probably formed by the chromoplast in connection with carbon assimilation, they are not made up in the main of carbon synthate. He thinks he has shown that dextrose is the first carbon synthate of the Phaeophyceae, and that this is condensed to laminarin. These vacuoles may be the means by which the synthate leaves the plastid, but it is not stored in them. On the contrary, it rapidly diffuses from them into the cytoplasm. He thinks these vacuoles, especially the older ones, are filled with substances resembling tannin, but

<sup>12</sup> HUTCHINSON, H. B., The influence of plant residues on nitrogen fixation and on losses of nitrate in the soil. Jour. Agric. Sci. 9:92-111. 1918.

<sup>13</sup> KYLIN, HERALD, Über die Fucosanblasen der Phaeophyceen. Ber. Deutsch. Bot. Gesells. 36:10-19. 1918.